Patent Abstracts

These Patent Abstracts of recently issued patents are intended to provide the minimum information necessary for readers to determine if they are interested in examining the patent in more detail. Complete copies of patents are available for a small fee by writing: U.S. Patent and Trademark Office, Box 9, Washington, DC 20231 USA.

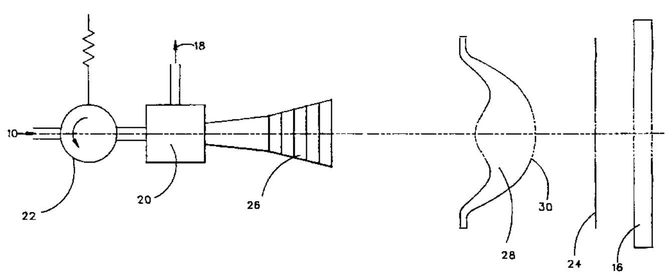
5,515,009 May 7, 1996

Space-Fed Horn for Quasi-Optical Spatial Power Combiners

Inventors: Sam H. Wong, Douglas K. Waineo, James A. Benet, and Chris I. Igwe.
Assignee: Rockwell International Corporation.
Filed: Sept. 13, 1994.

***Abstract*—**A spatial power combiner includes a circularly corrugated horn **26**, a meniscus lens **28**, an amplifier array **16**, and a layer of microwave-absorbing material **34** on a housing interior **32**. The lens **28** receives polarized microwave radiation from the horn **26** and collimates it, renders it in phase and with nearly uniformly amplitude, and distributes it across the lens aperture. The amplifier **16** amplifies the radiation and re-radiates it, orthogonally polarized, to the lens **28**, which focuses it back down the horn **26**. An array of parasitic micropatches **24** between the lens **28** and amplifier array **16** provides impedance matching. A quarter-wave anti-reflecting coating **30** covers both surfaces of the lens **28**. The microwave absorbing material **34** reduces or prevents resonance of higher-order modes.

4 Claims, 3 Drawing Sheets



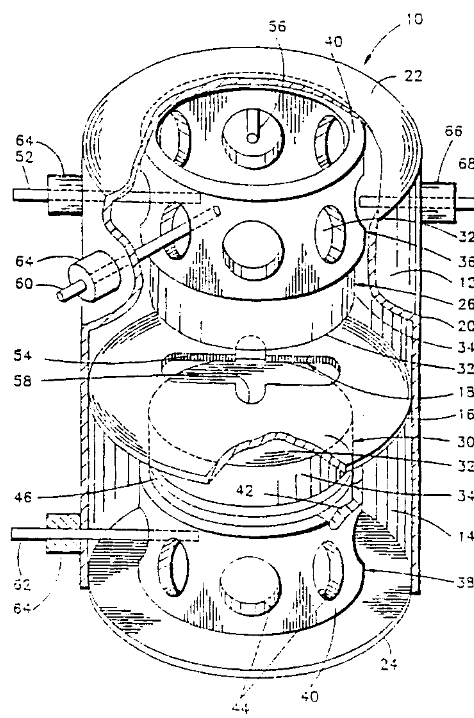
5,515,016 May 7, 1996

High-Power Dielectric Resonator Filter

Inventors: Stephen C. Holme, Slawomir J. Fiedziuszko, and Yujiro Honmyo.
Assignee: Space Systems/Loral, Inc.
Filed: June 6, 1994.

***Abstract*—**A dielectric resonator filter has a series of cavities enclosing respective ones of a series of dielectric resonators, wherein each cavity includes a resonator support configured as a cylinder of thermally conductive, electrically insulating material such as boron nitride. The support is positioned coaxially with the resonator along a central axis of the cavity, and is located in tandem with the resonator. Physical connection of the support to the resonator is facilitated by provision of a thread along an inner surface of the support, and the provision of an outer thread on the resonator surface to be received within the thread of the support. The support is mounted to an end wall of the cavity, thereby completing a thermally conductive path for withdrawal of heat from the resonator to the exterior of the filter. Each support is provided with windows through which tuning and/or mode coupling screws can be inserted, thereby locating a screw behind an end surface of the resonator. The screw is supported by a sidewall of the cavity and extends radially inward of the cavity in a plane which is parallel to the resonator end surface and spaced apart from the end surface to inhibit the formation of electric discharge arcs in the case of elevated electromagnetic power. Coupling between cavities is accomplished by means of a cruciform iris.

14 Claims, 2 Drawing Sheets



5,515,195 May 7, 1996

Optical Bus Using Controllable Optical Devices

Inventor: Larry R. McAdams.
Assignee: Optivision Incorporated.
Filed: June 25, 1993.

Abstract*—**A bidirectional optical bus and bus interface. Each functional unit (**35**, **37**) includes an active coupler (**60**, **70**) for each bus line (**40a*, **40***b*) with which it is to interface. Each coupler is a four-port device, controllable to

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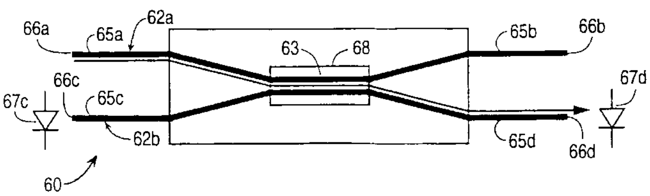
assume a desired one of at least two states characterized by different coupling coefficients. In the first state, a significant fraction (possibly all) of the light incoming to the first port ($\mathbf{65}a$) is coupled to the fourth port ($\mathbf{65}d$) and a significant fraction of the light incoming to the second port ($\mathbf{65}b$) is coupled to the third port ($\mathbf{65}c$). In the second state, most of the light incoming to the first port is coupled to the second port with a small fraction coupled to the fourth port, and most of the light incoming to the second port is coupled to the first port with a small fraction coupled to the third port. The couplers for a given bus line are serially connected with their respective first and second ports in line with the optical bus medium, and light is injected into the optical medium from both ends. A functional unit places data onto the bus by controlling its coupler according to a desired data pattern to switch between the first state and another state of significantly lower coupling coefficient.

33 Claims, 6 Drawing Sheets



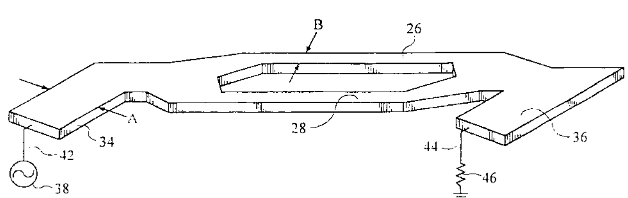
5,515,463 May 7, 1996

Multi-Branch Microwave Line for Electrooptical Devices

Inventor: Kenneth H. Hahn.
Assignee: Hewlett-Packard Company.
Filed: Mar. 10, 1995.

***Abstract*—**An electrooptical device for controlling an optical signal in response to an electrical signal includes a substrate having an optical path in which at least two waveguide arms diverge from an input portion. Typically, the waveguide arms include parallel regions and include convergence to an output portion. An electrical transmission line having a desired electrical impedance is positioned relative to the substrate for selectively changing the indices of refraction of the waveguide arms. The transmission line is a multi-branch design, with the branches in a one-to-one correspondence with the waveguide arms, so that each signal branch is aligned relative to a corresponding waveguide arm to couple an index-affecting electrical field to the corresponding waveguide arm. Preferably, the waveguide arms have opposite poling polarities, with each poling polarity being perpendicular to the direction of light propagation through the waveguide arms. Thus, a push–pull effect is achieved when identical electrical fields are generated by the branches of the single transmission line.

17 Claims, 2 Drawing Sheets



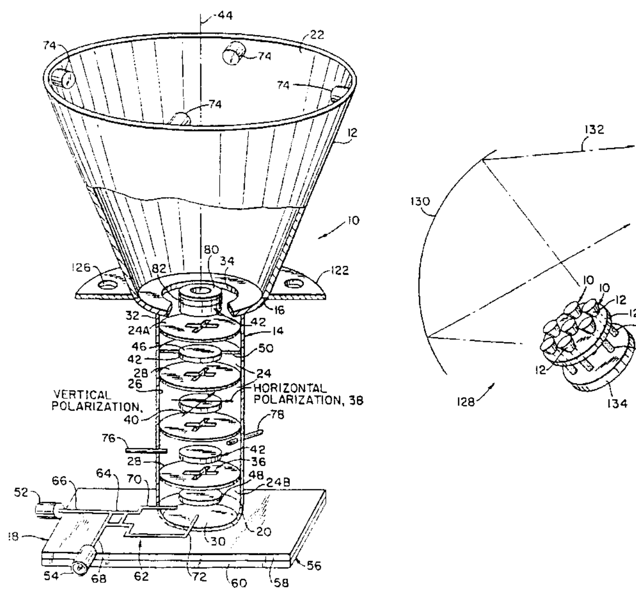
5,517,203 May 14, 1996

Dielectric Resonator Filter with Coupling Ring and Antenna System Formed Therefrom

Inventor: Slawomir J. Fiedziuszko.
Assignee: Space Systems/Loral, Inc.
Filed: May 11, 1994.

***Abstract*—**A plurality of dual-mode, dielectric resonator-loaded cavity filters may be coupled to respective ones of a plurality of radiators of an array antenna, such as a phased array antenna. Each of the filters is provided with a thin annular, electrically conductive ring disposed on a resonator surface facing the corresponding radiator of the antenna. The ring greatly increases the coupling of electromagnetic power for circularly and linearly polarized waves between the filter and the radiator for radiation of the power from the radiator into space, as well as during reception of radiation from outer space. The filter is operative also, if desired, to provide such coupling of electromagnetic power to a waveguide, as well as directly into the external environment. The ring may be located at the opening of the cavity through which the power is coupled between the filter and the radiator or the waveguide of the empty space.

29 Claims, 6 Drawing Sheets



5,517,206 May 14, 1996

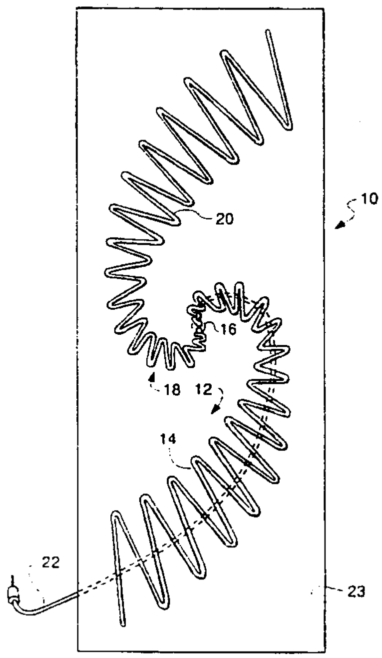
Broad-Band Antenna Structure

Inventors: Theresa C. Boone, Russell W. Johnson, and Farzin Lalezari.
Assignee: Ball Corporation.
Filed: July 30, 1991.

***Abstract*—**An antenna structure is provided having one or more spiral antenna arms extending outwardly from a lateral center axis. Each arm is defined by an antenna element disposed in a zig-zag configuration to provide reactive loading to the arm, wherein each arm receives or transmits radio frequency waves about a longitudinal center axis of the arm and the zig-zag element configuration. Thus, the antenna structure has a broader bandwidth than other antennas requiring the same amount of space. The antenna structure also has a substantially omni-directional radiation pattern and a low profile. Each antenna element can be metallization disposed on a support structure or can be one or more cable conductors. A feed means is provided which can be connected to the elements proximate to the lateral center axis and positioned along or coincident with the longitudinal center axis of one arm or can be connected to one of the elements distal to the lateral center axis. In both methods of feeding the antenna arms, the antenna elements function as

part of an infinite balun. In one application, the antenna structure is secured within the nonmetallic roof structure of an automobile.

46 Claims, 4 Drawing Sheets



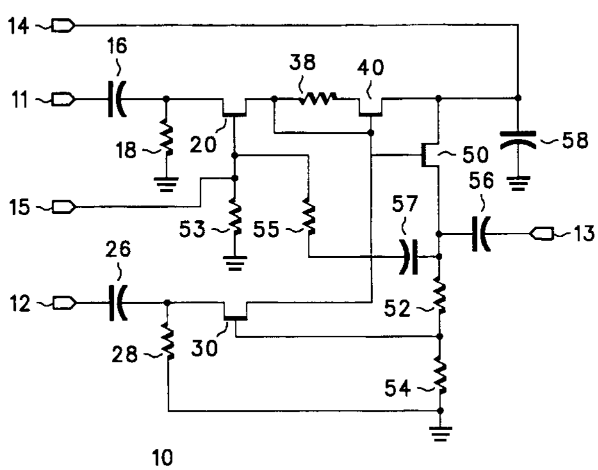
5,517,688 May 14, 1996

MMIC FET Mixer and Method

Inventors: Lyle A. Fajen and Michael Dydyk.
Assignee: Motorola, Inc.
Filed: June 20, 1994.

Abstract—A MMIC FET mixer and method includes a RF input port for receiving a RF signal, a feedback control input for receiving a feedback signal, and a LO input port for receiving a LO signal. A feedback controller is coupled to the RF amplifier, the feedback controller for producing a controlled RF signal in response to the feedback signal. A constant current source is coupled to the feedback controller, to the RF amplifier, and to the LO input port. The constant current source receives a dc offset voltage, the controlled RF signal, and the LO signal and produces an IF output signal at an IF output port. The IF output signal is proportional to the dc offset voltage, to the RF signal, and to the LO signal.

13 Claims, 2 Drawing Sheets



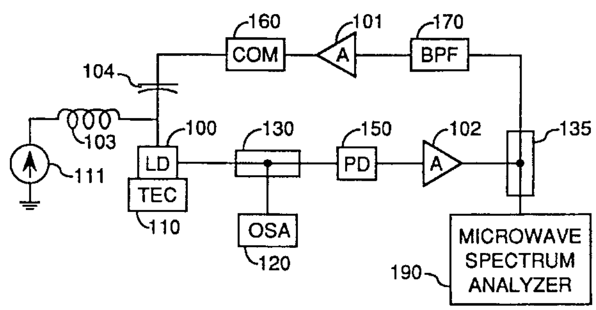
5,519,362 May 21, 1996

Optical Current-Controlled Oscillators

Inventors: Guifang Li, Raymond K. Boncek, Xiaolu Wang, and David H. Sackett.
Assignee: The United States of American as represented by the Secretary of the Air Force.
Filed: Aug. 23, 1995.

Abstract—The observation of self-sustained pulsation and transient self-pulsation in laser diodes at 1300 nm is described with the effects of optoelectronic feedback on the pulsations. Transient self-pulsation has a lifetime of a few minutes with frequencies up to 7 GHz. The linewidth of self-pulsation is on the order of 0.5 GHz. With optoelectronic feedback, the transient self-pulsation can be stabilized and enhanced. The center frequency of feedback-sustained pulsation is dependent on the passband of the bandpass filter in the feedback loop. The linewidth of feedback-sustained pulsation is significantly reduced to about 20 kHz. The optical spectra of the laser diodes exhibit coherence collapse at weak optoelectronic feedback. The feedback sustained pulsation can be frequency modulated. Applications of the feedback-sustained pulsation include subcarrier multiplexing optical networks.

12 Claims, 3 Drawing Sheets



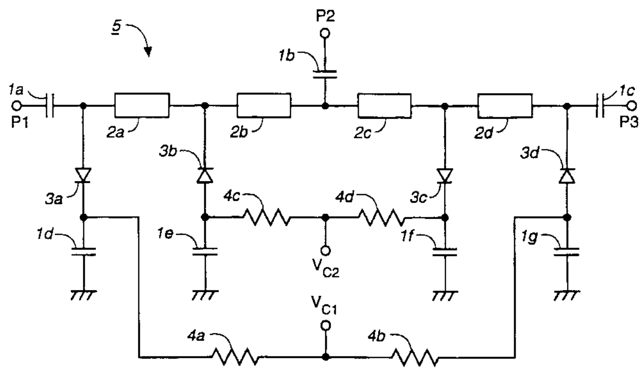
5,519,364 May 21, 1996

High-Frequency Switch

Inventors: Mitsuhide Kato, Koji Furutani, and Teruhisa Tsuru.
Assignee: Murata Manufacturing Co., Ltd.
Filed: June 5, 1995.

Abstract—A high-frequency switch, having a first port, a second port, and a third port and serving to selectively connect the second port to the first or third port, includes a first distributed constant line and a second distributed constant line which are connected in series between the first and second ports, a third distributed constant line, and a fourth distributed constant line which are connected in series between the second and third ports, a first diode connected between the first port and the ground, a second diode connected between a junction point between the first and second distributed constant lines and the ground, a third diode connected between a junction point between the third and fourth distributed constant lines and the ground, a fourth diode connected between the third port and the ground, a first resistor and a second resistor which are connected in series between grounded electrodes of the first and fourth diodes, and a third resistor and a fourth resistor which are connected in series between grounded electrodes of the second and third diodes, wherein the first and second diodes have different polarity, the third and fourth diodes have different polarity, and the first and fourth diodes have different polarity with respect to a line between the first and third ports.

12 Claims, 2 Drawing Sheets



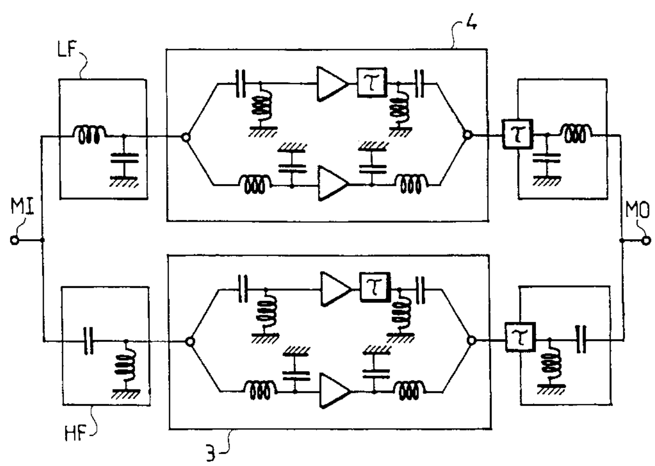
5,519,434 May 21, 1996

Split-Band Amplifier for Television Signals

Inventor: Jean-Marc Fasquel.
Assignee: U.S. Philips Corporation.
Filed: June 7, 1995.

***Abstract*—**A split-band device for transmitting and amplifying television signals between an input terminal and an output terminal which can each be coupled to a distribution cable having a characteristic impedance $\mathbf{R_0}$. The device comprises first and second parallel-arranged branches comprising, respectively, first and second amplifiers. The first branch has a high-pass first filter arranged between the input terminal and its first amplifier and the second branch has a low-pass second filter arranged between the input terminal and its second amplifier to select a second frequency range different from a first frequency range of the first amplifier. The first and second filters each have the same nominal cutoff frequency, with the first filter having at its input an input capacitance disposed in series in the first branch and having a value C, and with the second filter having at its input an input inductance disposed in series in the second branch and having a value L, the nominal value of the ratio of the values L/C being equal to 2 $\mathbf{R}^{\mathbf{02}}$.

12 Claims, 1 Drawing Sheet



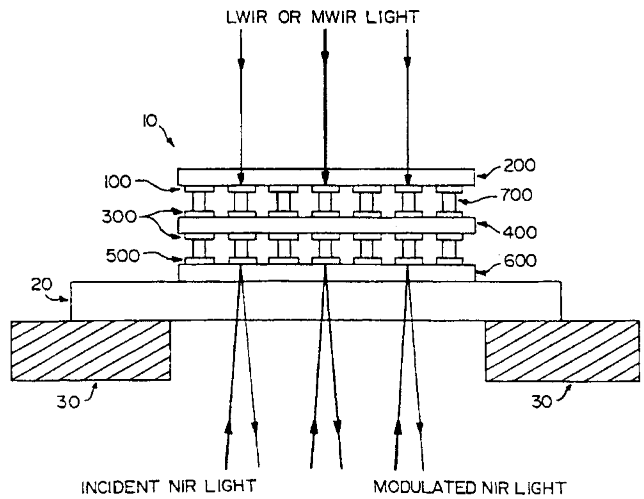
5,519,529 May 21, 1996

Infrared Image Converter

Inventors: John S. Ahearn and John W. Little, Jr.
Assignee: Martin Marietta Corporation.
Filed: Feb. 9, 1994.

***Abstract*—**A device for converting a mid-wave infrared or long-wave infrared thermal image into a coherent near-infrared image includes a two-dimensional array of quantum-well-based optical modulators and infrared photodetectors. Each modulator is integrated or hybridized with a respective photodetector, and the combination is connected to an electronic circuit. Variations in mid-IR or long-IR light intensity are converted by each photodetector into variations in a bias applied to its respective modulator. The bias variations modulate the intensity and/or phase of near-IR light illuminating the modulators.

6 Claim, 6 Drawing Sheets



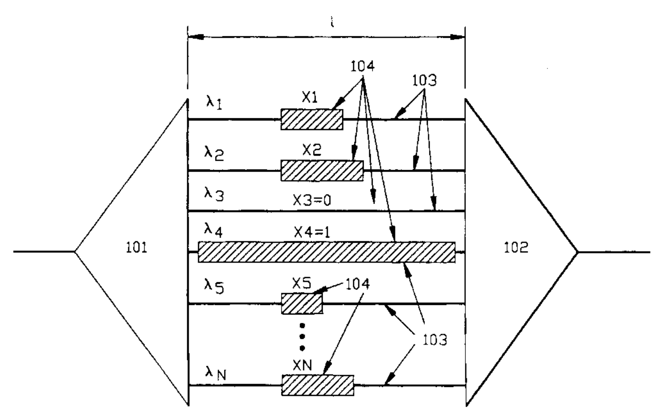
5,519,796 May 21, 1996

Gain Equalization Using Monolithic Planar Waveguide Grating Multiplexer and Demultiplexer

Inventors: Chung-Sheng Li and Franklin F.-K. Tong.
Assignee: International Business Machines.
Filed: Mar. 6, 1995.

***Abstract*—**A monolithically integrated equalization optical equalization device having an optical demultiplexer for demultiplexing an optical signal into a number of individual channels and a number of optical connections for connecting the terminals of the demultiplexers to an optical multiplexer. Metallic strips of varying lengths are deposited on the optical connections so that the optical signal is equalized over the channels at the output terminals of the optical multiplexer.

7 Claims, 1 Drawing Sheet



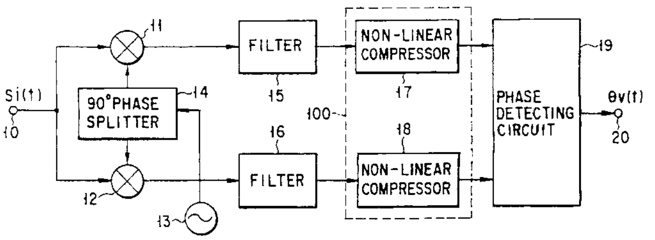
5,521,548 May 28, 1996

Phase Detector

Inventor: Tsutomu Sugawara.
Assignee: Kabushiki Kaisha Toshiba.
Filed: June 23, 1995.

Abstract—In a phase detector, an input signal (Si) is multiplied in a multiplier by two reference signals intersecting at right angles with each other. Signals obtained by multiplication are passed through filters and subjected to quadrature demodulation. An I signal and a Q signal obtained by quadrature demodulation are input to nonlinear compression circuits and compressed by logarithmic conversion. Based on the compressed I and Q signals, a phase detection circuit detects the phase of the input signal (Si).

18 Claims, 10 Drawing Sheets



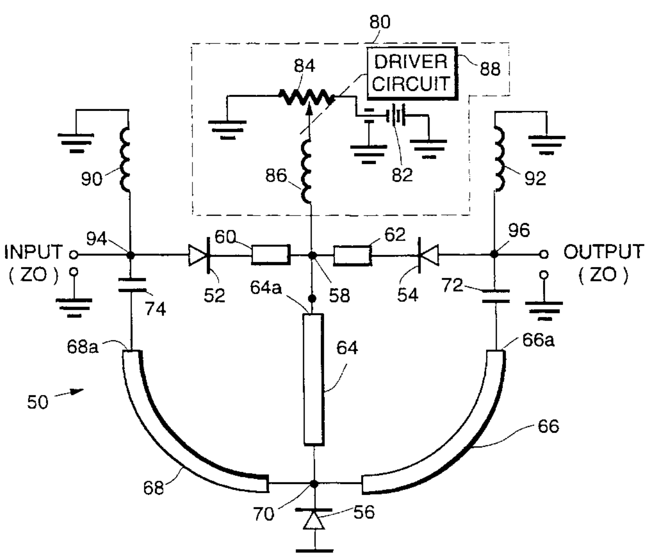
5,521,560 May 28, 1996

Minimum Phase Shift Microwave Attenuator

Inventors: Richard W. Burns and Darren E. Atkinson.
Assignee: Hughes Aircraft Company.
Filed: Nov. 18, 1994.

Abstract—A minimum phase shift microwave attenuator circuit, providing very low insertion phase change with changing attenuation levels. Three p-i-n diodes are biased in parallel from a common node. The p-i-n diodes are held at zero or reverse bias for the "no attenuation" state, and are made slightly lossy to produce the attenuation state. In the attenuation state, the p-i-n diodes are utilized as current controlled lossy capacitors which change resistance with applied bias, but maintain constant capacitance, thereby providing low insertion phase deviation across wide attenuation levels.

29 Claims, 4 Drawing Sheets



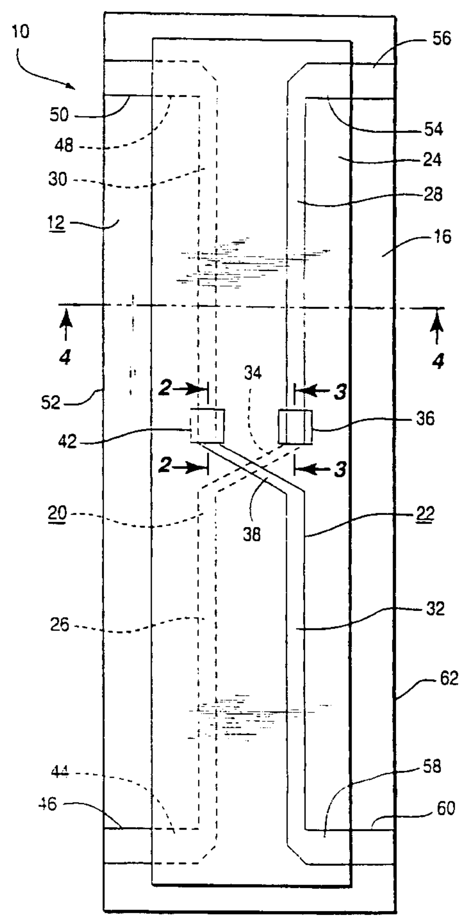
5,521,563 May 28, 1996

Microwave Hybrid Coupler

Inventor: Joseph B. Mazzochette.
Assignee: EMC Technology, Inc.
Filed: June 5, 1995.

Abstract—A hybrid coupler which includes a substrate of an insulating material having a pair of opposed surfaces. A conductive ground plane is on one of the substrate surfaces. A pair of conductive transmission lines are over the other substrate surface and a layer of a dielectric material is over the other substrate surface. Each of the transmission lines has one portion which is on the substrate surface and under the dielectric layer, another portion which is over the dielectric layer, and a connecting portion which electrically connects the two portions of the transmission line. Each of the connecting portion extends through an opening in the dielectric layer, and one of the connecting portions crosses over the other connecting portion. The portions of the transmission lines may extend in straight lines, in a serpentine path, or in a rectangular path. The portions of the transmission lines have ports at one end with the ports of the one portions of the lines being adjacent the same edge of the substrate, and the ports of the other portions of the lines being adjacent the same edge of the substrate.

16 Claims, 3 Drawing Sheets



5,521,994 May 28, 1996

Semiconductor Optical Waveguide-Integrated Light-Receiving Device

Inventors: Takeshi Takeuchi, Kenko Taguchi, Keiro Komatsu, Masako Yamamoto, and Kiichi Hamamoto.
Assignee: NEC Corporation.
Filed: June 7, 1995.

***Abstract*—**Disclosed herein is a semiconductor optical waveguide-integrated light-receiving device comprising a waveguide-type photodetector and a passive optical waveguide which are selectively formed on the same substrate, wherein the width of mask for a selective growth is varied along the waveguiding direction so as to simultaneously form core layers which differ from each other in absorption edge wavelength. The core layer may be formed with an MQW layer. It is also featured that waveguide width of the photodetector is made larger than the waveguide width of the optical waveguide. The photodetector and the optical waveguide may be buried by an n-InP layer.

12 Claims, 8 Drawing Sheets